BROOKHAVEN NATIONAL LABORATORY

Work Permit # DRL-2011-10/SS-2010-
Work Order # _____
Job# _____ Activity# _____

1. Work requester fills out this section. ☐ **Standing Work Permit**

Requester: Don Lynch	Date: 0715/11	Ext.: 2253	Dept/Div/Group: PO/PHENIX
Other Contact person (if different from requester): Carter Biggs			Ext.: 7515
Work Control Coordinator: Don Lynch		Start Date: 07/18/11	Est. End Date: 12/1/2011
Brief Description of Work: Removal and Maintenance/Upgrade of VTX detector subsystem in CM region of PHENIX IR, Integration with FVTX, Reinstallation in CM region			
Building: 1008	Room: IR	Equipment: VTX E & W	Service Provider: PHENIX techs

. WCC, Requester/Designee, Service Provider, and ES&H (as necessary) fill out this section or attach analysis

ES&H ANALYSIS				
Radiation Concerns	☒ None	☐ Activation	☐ Airborne	☐ Contamination	☒ Radiation
Radiation Generating Devices:	☐ Radiography	☐ Moisture Density Gauges	☐ Soil Density Gauges	☐ X-ray Equipment
☐ Special nuclear materials involved, notify Isotope Special Materials Group			☐ Fissionable materials involved, notify Laboratory Criticality Officer	
Safety Concerns	☐ None	☐ Ergonomics	☐ Transport of Haz/Rad Material	
☐ Adding/Removing Walls or Roofs	☐ Confined Space*	☐ Explosives	☐ Lead*	☐ Penetrating Fire Walls
	☐ Corrosive	☐ Flammable	☐ Magnetic Field*	☐ Pressurized Systems
☐ Asbestos*	☐ Cryogenic	☐ Fumes/Mist/Dust*	☐ Material Handling	☐ Rigging/Critical Lift
☐ Beryllium*	☐ Electrical	☐ Heat/Cold Stress	☐ Noise*	☐ Toxic Materials*
☐ Biohazard*	☒ Elevated Work*	☐ Hydraulic	☐ Non-ionizing Radiation*	☐ Vacuum
☐ Chemicals*	☐ Excavation	☐ Lasers*	☐ Oxygen Deficiency*	☐ Other
* Does this work require medical clearance or surveillance from the Occupational Medicine Clinic? ☐ Yes ☒ No				
Environmental Concerns		☒ None	☐ Work impacts Environmental Permit No.	
☐ Atmospheric Discharges (rad/non-rad)		☐ Land Use	☐ Soil Activation/contamination	☐ Waste-Mixed
☐ Chemical or Rad Material Storage or Use		☐ Liquid Discharges	☐ Waste-Clean	☐ Waste-Radioactive
☐ Cesspools (UIC)		☐ Oil/PCB Management	☐ Waste-Hazardous	☐ Waste-Regulated Medical
☐ High water/power consumption		☐ Spill potential	☐ Waste-Industrial	☐ Underground Duct/Piping
Waste disposition by:				☐ Other
Pollution Prevention (P2)/Waste Minimization Opportunity:		☒ None ☐ Yes		
FACILITY CONCERNS	☒ None			
☐ Access/Egress Limitations	☐ Electrical Noise	☐ Potential to Cause a False Alarm		☐ Vibrations
	☐ Impacts Facility Use Agreement		☐ Temperature Change	☐ Other
☐ Configuration Control	☐ Maintenance Work on Ventilation Systems		☐ Utility Interruptions	
WORK CONTROLS				
Work Practices				
☐ None	☐ Exhaust Ventilation	☒ Lockout/Tagout	☐ Spill Containment	☐ Security (see Instruction Sheet)
☒ Back-up Person/Watch	☐ HP Coverage	☐ Posting/Warning Signs	☐ Time Limitation	☐ Other
☐ Barricades	☐ IH Survey	☐ Scaffolding-requires inspection	☐ Warning Alarm (i.e. "high level")	
Protective Equipment				
☐ None	☐ Ear Plugs	☐ Gloves	☐ Lab Coat	☒ Safety Glasses
☐ Coveralls	☐ Ear Muffs	☐ Goggles	☐ Respirator	☐ Safety Harness
☐ Disposable Clothing	☐ Face Shield	☐ Hard Hat	☐ Shoe Covers	☒ Safety Shoes ☐ Other
Permits Required (Permits must be valid when job is scheduled.)				
☒ None	☐ Cutting/Welding	☐ Impair Fire Protection Systems		
☐ Concrete/Masonry Penetration	☐ Digging/Core Drilling	☐ Rad Work Permit-RWP No		
☐ Confined Space Entry	☐ Electrical Working Hot	☐ Other		
Dosimetry/Monitoring				
☐ None	☐ Heat Stress Monitor	☐ Real Time Monitor	☐ TLD	
☐ Air Effluent	☐ Noise Survey/Dosimeter	☐ Self-reading Pencil Dosimeter	☐ Waste Characterization	
☐ Ground Water	☐ O_2/Combustible Gas	☐ Self-reading Digital Dosimeter	☐ Other Check O2 level prior to entry	
☐ Liquid Effluent	☐ Passive Vapor Monitor	☐ Sorbent Tube/Filter Pump		
Training Requirements (List below specific training requirements)				
CA –Collider User, PHENIX Awareness, Working at heights				
Based on analysis above, the Walkdown Team determines the risk, complexity, and coordination ratings below:			**If using the permit when all hazard ratings are low, only the following need to sign: (Although allowed, there is no need to use back of form)**	
ES&H Risk Level:	☒ Low ☐ Moderate ☐ High		WCC:	Date:
Complexity Level:	☐ Low ☒ Moderate ☐ High		Service Provider:	Date:
Work Coordination:	☒ Low ☐ Moderate ☐ High		Authorization to start	Date:
			(Departmental Sup/WCC/Designee)	

3. Both work requester and service provider contribute to work plan (use attachments for detailed plans)

Work Plan During the 2011 Shutdown, PHENIX will be (1) uninstalling the VTX detector subsystem, (2) transporting the VTX detector subsystem to a BNL Chemistry lab for maintenance and upgrade, (3) integrating the new PHENIX FVTX detector subsystem into the VTX support structure (4) transporting the combined subsystems back to the PHENIX IR for installation and commissioning for PHENIX run 12. The procedure for accomplishing this is contained in the attached installation procedure.
Special Working Conditions Required: None
Operational Limits Imposed: Modification work limited to lower octants easily reachable when standing on lower magnet superstructure.
Post Work Testing Required: No

Job Safety Analysis Required: ☐ Yes ☒ No	Walkdown Required: ☒ Yes ☐ No

Reviewed by: Primary Reviewer will determine the size of the review team and the other signatures required based on hazards and job complexity. Primary Reviewer signature means that the hazards and risks that could impact ES&H have been identified and will be controlled according to BNL requirements.

Title	Name (print)	Signature	Life #	Date
Primary Reviewer				
ES&H Professional				
Other				
Other				
Work Control Coordinator	Don Lynch		20146	
Service Provider				
	Review Done: ☐ in series	☐ team		

4. Job site personnel fill out this section.

Note: Signature indicates personnel performing work have read and understand the hazards and permit requirements (including any attachments).			
Job Supervisor:		Contractor Supervisor:	
Workers:	Life#:	Workers :	Life#:
Workers are encouraged to provide feedback on ES&H concerns or on ideas for improved job work flow. Use feedback form or space below.			

5. Departmental Job Supervisor, Work Control Coordinator/Designee

Conditions are appropriate to start work: (Permit has been reviewed, work controls are in place and site is ready for job.)			
Name:	Signature:	Life#:	Date:

6. Departmental Job Supervisor, Work Requester/Designee determines if Post Job Review is required. ☐ Yes ☐ No

Post Job Review (Fill in names of reviewers)			
Name:	Signature:	Life#:	Date:
Name:	Signature:	Life#:	Date:

7. Worker provides feedback.

Worker Feedback (use attached sheets as necessary)
a) WCM/WCC: Is any feedback required? ☐ Yes ☐ No

b) Workers: Are there better methods or safer ways to perform this job in the future? ☐ Yes ☐ No

8. Closeout: Work Control Coordinator (authorizing dept.) checks quality of completed permit and ensures the work site is left in an acceptable condition. (WCC can delegate clean up of work area to work supervisor)

Name:	Signature:	Life#:	Date:
Comments:			

Work plan Attachment **WP# DRL-2011-10/SS-2011-**

FVTX & VTX Detectors Handling, Assembly & Installation Procedure

Introduction

During the 2011 shutdown the PHENIX technical staff will be installing a new detector subsystem designed to provide greater precision and scope to the PHENIX experiment. This system, abbreviated as "FVTX", will be installed in an existing support structure already supporting the existing PHENIX "VTX" detector subsystem in the PHENIX Central Magnet ("CM") between the CM poles and around the PHENIX beampipe. The FVTX plans to build upon the service of the existing and previous detectors as the PHENIX experiment probes deeper into the nature of sub-atomic particles.

The FVTX is comprised of 4 disks of detectors longitudinally surrounding the beampipe and spaced north and south of the VTX subsystem. Similar to the VTX, the FVTX is physically divided into 2 semi-cylinders for ease of installation. The detector signals are read out to circuit boards which amplify and convert the signals to light signals to be transferred to the PHENIX Data Acquisition system via optical fibers. These support electronics are mounted on large circular aluminum disks dubbed "big wheels". The detector and support electronics on the big wheels are cooled to predetermined temperatures for optimum operating conditions using a proprietary thermal transfer fluid, NOVEC 7200. The internal atmosphere of the detector subsystem is kept free of condensation/moisture by flowing gaseous nitrogen. The NOVEC 7200 and N_2 distribution systems are already in place to support the existing VTX subsystem and having been designed and specified to accommodate both subsystems. The distribution circuits and flow control equipment to support the FVTX are already in place.

There will also be 2 electronics racks required to support the FVTX. Both racks will be mounted on the CM "bridge" platform (above the CM upper flux return). These racks will supply HV and LV to the detector electronics as well as housing the fiber optics patch panel for the detector signal processing. Each of these require cables, cable management and support hardware, etc., which will be accomplished by expanding the capabilities of the existing VTX support services.

In this document, all facets of the preparation, assembly, installation, alignment, and commissioning of the FVTX detector subsystem and its support equipment, handling for removal of the VTX subsystem and integration of the FVTX into the VTX are discussed, related documents are referenced and the procedures to be followed are detailed.

(Note: The FVTX & VTX Integration Plan illustrates the work covered in this procedure and is attached hereto. In addition the VTX installation work permit from the 2010 shutdown included the VTX cooling plan, VTX survey plan, VTX assembly plan and VTX assembly procedure which are essentially unchanged for the 2011 VTX & FVTX installation except as noted herein. Copies of that work permit are available for reference purposes.)

Removal of VTX from CM Region

I. Removing Cabling and piping services (East & West Detectors)

   a. Carefully label all Bias, LV, signal and monitoring cables with the VTX numbering system currently in use to minimize confusion when restoring these services

b. Similarly carefully label all piping connections for cooling and environmental control.

c. Disconnect each cable, one at a time, coil the cables neatly and use cable ties to secure the cables in an area they will be safe until need again during re-installation of the VTX.

d. Turn off coolant flow and drain all coolant from the VTX detector and bigwheel electronics.

e. Disconnect all piping, plug the VTX fluid connections and cap the piping.

f. Coil all piping and secure it where it will remain safe until need again during re-installation of the VTX.

g. Install the east and west support rail installation extensions. Install the soft beampipe shield and hard beampipe protectors around the central beampipe.

II. East Detector Section Removal

a. Separate the east VTX detector half from the west half.

b. Slide the east half detector away from the beampipe.

c. Mount the VTX installation fixture on the east VTX detector half

d. Rig the east VTX detector half installation fixture to the IR crane lift it off the rails and set it on the 12 ton cart to transport the assembly to the PHENIX AH, taking care not to jostle or otherwise disturb, distort, twist or shock the assembly.

e. Rig the east VTX detector half from the cart to the AH floor

f. Transport the east half on a smooth riding vehicle with vibration isolation to prevent motion damage to the detector, to the assigned Chemistry lab for maintenance and upgrade.

III. West Detector Section Removal

a. Retract west VTX to its "open" parked position

b. Attach the transport fixture to the west detector half.

c. Rig the transport fixture to the IR crane and lower the west half to the horizontal position.

d. Disconnect the rigging from the crane.

e. Slide the west VTX detector half carefully under the Beampipe taking care to avoid any potential snags or pinch points, and taking exceptional care to avoid contact with the beampipe and/or the beampipe protectors (soft and hard).

f. Attach rigging to the transport fixture.

g. Lift the west detector half from the rails and carefully place the west half on the 12 ton cart to transport the assembly to the PHENIX AH, taking care not to jostle or otherwise disturb, distort, twist or shock the assembly.

h. Rig the west VTX detector half from the cart to the AH floor

i. Transport the west half on a smooth riding vehicle with vibration isolation to prevent motion damage to the detector, to the assigned Chemistry lab for maintenance and upgrade.

VTX Maintenance, Repair and Upgrade

The VTX assembly has experienced some problems during its maiden run. These problems have been diagnosed and repair procedures, hardware upgrades and assembly techniques have been established during the recently completed run to assure improvement in operating reliability during the next run. After receipt of the VTX halves at the assigned Chemistry lab, appropriate maintenance, repair and upgrade will be undertaken to this end.

During this procedure at appropriate levels of partial assembly, PHENIX technicians and BNL surveyors shall make a series of inspection measurements. These measurements are performed to assure positioning and alignment of internal components to the drawing requirements for accuracy and tolerance and to establish reference points to relate inner layers of the detector to outer layers and ultimately to the external surfaces of the completed detector. Since each layer tends to obscure the layer before it during assembly, it is critical that these reference points are established at appropriate junctures during the assembly. These inspection survey techniques were established during last year's shutdown and will be repeated for the VTX assembly this year to prepare the VTX for integration with the FVTX.

FVTX Assembly

Concurrent with the work being performed on the VTX subsystem, FVTX experts and PHENIX technicians will be similarly assembling, testing, inspecting and otherwise preparing the new FVTX subsystem for integration with the VTX. Details of the FVTX subsystem assembly are beyond the scope of this procedure. The survey concept for the FVTX is the same as for the VTX, with specific details to be worked out by surveyors and FVTX experts at the time of survey.

FVTX Integration into VTX

Integration of the FVTX subsystem into the common support structure and gas enclosure with the VTX subsystem shall take place in the VTX lab in the BNL Chemistry Department. Details of the assembly are described in the FVTX/VTX Plan which is attached to this work permit, and the FVTX subsystem detail assembly and subassembly drawings, which are available on request from PHENIX Engineering.

FVTX & VTX Combined Installation Procedure

I. West Detector Subsystems Section

a. After completion of assembly, pre-survey and alignment of the 2 FVTX/VTX detector halves, the west half shall be mounted on the FVTX/VTX Installation fixture with the OD of the detector facing down and transported to the PHENIX Assembly Hall ("AH"), taking care not to jostle or otherwise disturb, distort, twist or shock the assembly.

b. Install the east and west support rail installation extensions. Install the soft beampipe shield and hard beampipe protectors around the central beampipe.

c. Rig the west FVTX/VTX detector half onto the PHENIX 12 ton cart in the AH then roll the cart into the IR.

d. Rig the west FVTX/VTX detector half from the 12 ton cart to the east extension rail with the top of the detector facing west and the OD of the detector half facing down.

e. Slide the west FVTX/VTX detector half carefully under the Beampipe taking care to avoid any potential snags or pinch points, and taking exceptional care to avoid contact with the beampipe and/or the beampipe protectors (soft and hard)

f. After the detector is fully translated west under and clear of the beampipe, install stops to prevent the west half from contacting the beampipe.

g. Remove the hard and soft beampipe protectors.

h. Attach the IR crane to the lifting point on the FVTX/VTX installation fixture and carefully rotate the beampipe into its upright and open position.

i. Check alignment and make sure the west half has been restored to its aligned position relative to the rails.

j. Align/Survey the west FVTX/VTX detector half relative to the beampipe and PHENIX IR nominal IP, make appropriate corrections to the west half detector stops.

k. Retract west FVTX/VTX to its "open" parked position.

II. East Detector section

a. Mount the east FVTX/VTX detector half on the FVTX/VTX installation fixture and transport the assembly to the PHENIX AH, taking care not to jostle or otherwise disturb, distort, twist or shock the assembly.

b. Rig the east FVTX/VTX detector half onto the PHENIX 12 ton cart in the AH then roll the cart into the IR.

c. Rig the east FVTX/VTX detector half from the 12 ton cart to the east extension rail in the upright position.

d. Slide the east half detector near the beampipe and make precision adjustments as necessary to get it near its final position.

e. Slide the east half detector into its aligned position against the rail stops.

f. Mate the east FVTX/VTX detector half to the west half.

Final Survey and Alignment

After the FVTX/VTX east and west detector halves have been joined survey the entire detector by the external reference points established during pre-survey and record all info in the PHENIX survey data base. (Refer to the 2010 VTX Installation work permit for further information.)

Cooling, Gas Utilities and Electrical/Electronic Support

The FVTX/VTX detector requires cooling of its internal detector subsystems electronics to approximately 0°C and its routing electronics ("Big Wheel" electronics) to approximately room temperature. FVTX/VTX group experts have chosen Novec 7200 as the cooling medium for both internal and routing electronics for both detectors. The chiller system was installed and operated for the VTX subsystem in2010 and the additional circuits, manifolding and flow control for the FVTX are already in place and were operated in bypass mode during Run 10.

Gas utilities for this project consist only of gaseous N2, to be supplied by the PHENIX N2 gas system. Installation of the N2 flow control, piping, and all tasks in support of the N2 flow control and piping Were installed during the 2010 VTX installation and are fully described in the work permit for that effort.

Electrical/electronic support for the VTX are already in place and has been fully operational during Run 11. The respective electrical electronics support for the FVTX system includes 2 new racks on the PHENIX CM bridge rack platform. The installation requirements have been fully reviewed by CAD and are described in the attached FVTX & VTX Integration Plan.

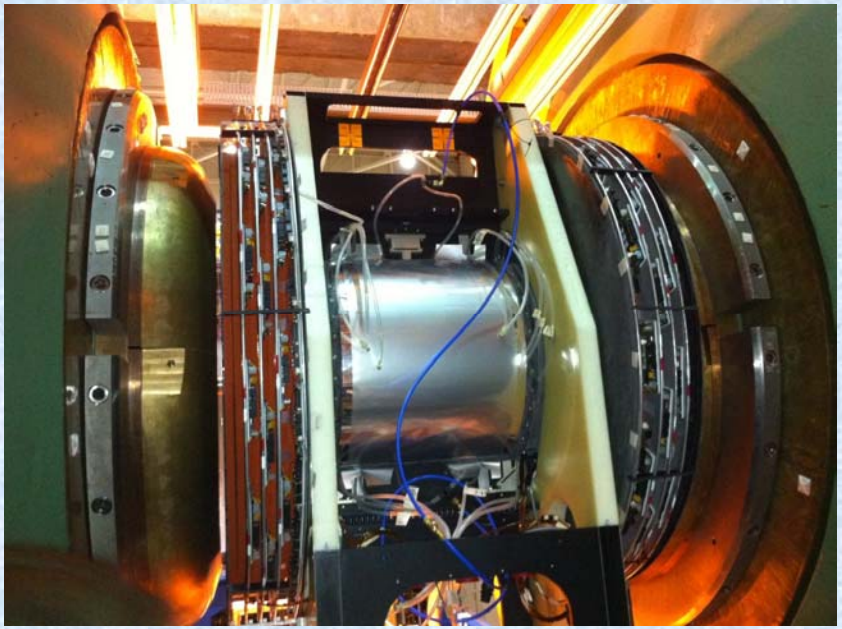
Testing and Commissioning

Testing and commissioning of the installed FVTX/VTX detector subsystem shall commence immediately after mechanical installation of components is complete. This may be a partial or complete installation of the FVTX/VTX subsystem as deemed appropriate by the FVTX/VTX system experts in coordination with PHENIX DAQ system experts and work control coordinators. The testing and commissioning efforts shall be performed by PHENIX technicians, engineers and FVTX/VTX subsystem experts. Planning for these tasks will be on a day-by-day basis as the tasks progress. PHENIX engineering may identify specific tasks during this time as appropriate for enhanced work planning, and in such cases enhanced work permits for those tasks shall be generated by the person(s) designated as work control coordinator(s) for the specific workers performing those specific task(s). In such cases reference to such enhanced work planning shall be made on the work permit encompassing this procedure.

Installation Closeout

When all work described in this work permit has been completed, the PHENIX work coordinator for this set of tasks shall collect feedback from all parties (PHENIX engineers and technicians and FVTX/VTX experts). This feedback shall include critical review of any problems encountered during installation, solutions to such problems, changes to work procedures described herein during the conduct of this work, suggestions for improvements in equipment procedures and techniques and any other information deemed useful and/or relevant by the PHENIX work control coordinator. Such information shall be appropriately disseminated to the various affected/interested parties and a copy of this information shall be attached to this work permit when it is closed out.

VTX Removal, Maintenance Integration with FVTX and Re-installation During Shutdown 2011



VTX & FVTX Summary of Tasks

VTX Disassembly – After Start of shutdown tasks are completed (EC out to AH), coolant and N_2 lines, LV, signal and HV cables and fibers will be carefully removed and coolant drained. East and west detector halves will then be de-mounted and transported to Chemistry bldg for maintenance and overhaul.

At PHYSICS FVTX lab –FVTX disks, electronics, bigwheels and connectors assembled and assemblies pre-surveyed.

Concurrently at Chemistry lab –VTX disassembled into individual barrels and bigwheels, grounding issues on spiro boards fixed, clamping problems with Hirose connectors fixed, marginal LDTB boards fixed/replaced, bad pixel and strip pixel ladders replaced, boards, ladders etc. tested and characterized. Cycle tests performed to burn in new fixes. Each barrel pre-surveyed and the 2 detector halves re-assembled. Assembled VTX surveyed.

Concurrently at PHENIX 1008 – modifications to cable trays, fix flowmeter thermal cycling sensitivity, fix thermocouple connector problems.

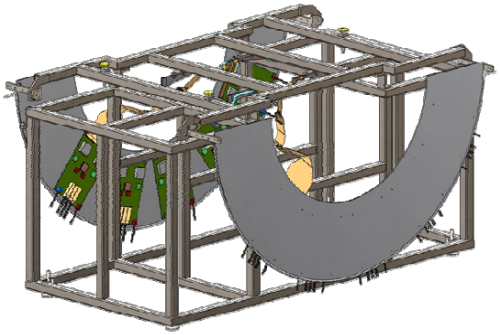
FVTX transported to Chemistry building. FVTX Integrated into VTX. VTX/FVTX assembly surveyed

VTX&FVTX assembly transported to PHENIX and installed on rails.

coolant and N_2 lines, LV, signal and HV cables and fibers will be carefully removed and coolant

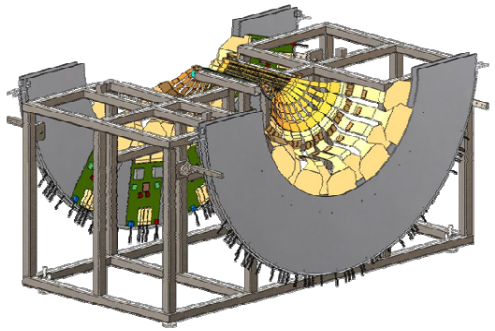
Barrel 1 Assembly (Stave Installation)

- Pixel Stave are installed in Barrel 1 Mount
- Extension Cables are attached to the Spiro Cards



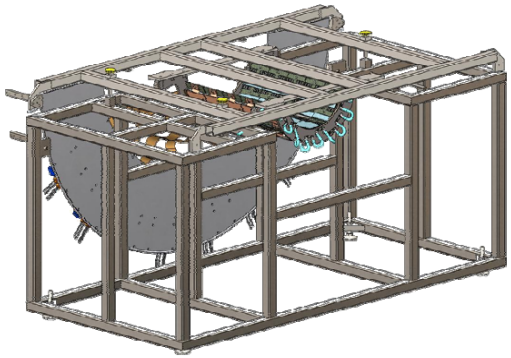
Barrel 2 Assembly (Cooling Tube Installation)

- After all Staves are installed, Cooling Tubes are connected
- The Big Wheels are moved to their final positions



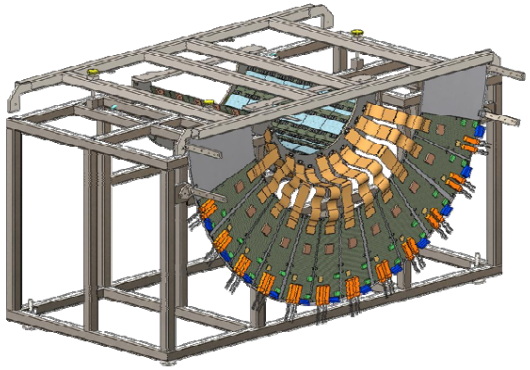
Barrel 3 Assembly (Transport Frame)

- Transport Frame is attached to the Barrel 3 Mounts
  - The Transport Frame has adjustment screws so that it can be carefully matched to the Barrel Mounts



Barrel 4 Assembly (Transport Frame)

- Transport Frame is attached to the Barrel 4 Mounts
  - The Transport Frame has adjustment screws so that it can be carefully matched to the Barrel Mounts



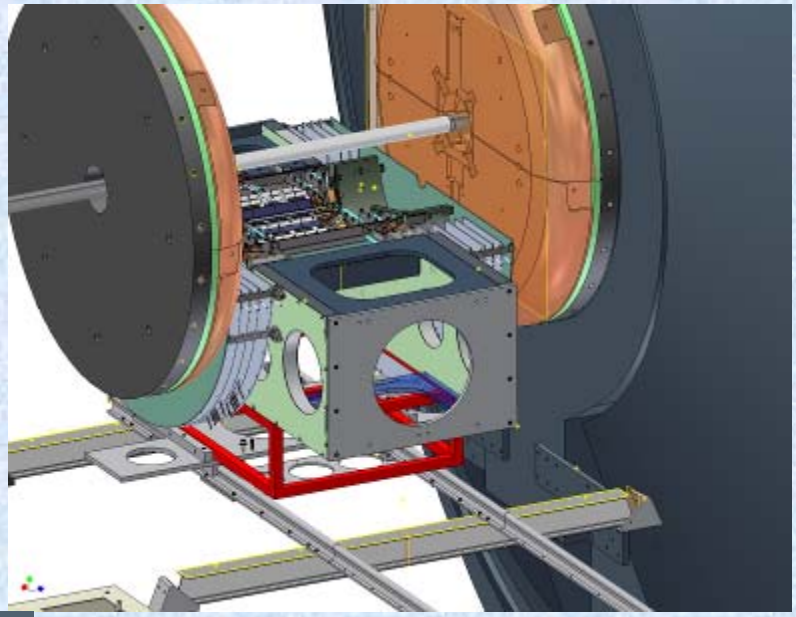
VTX Assemblies

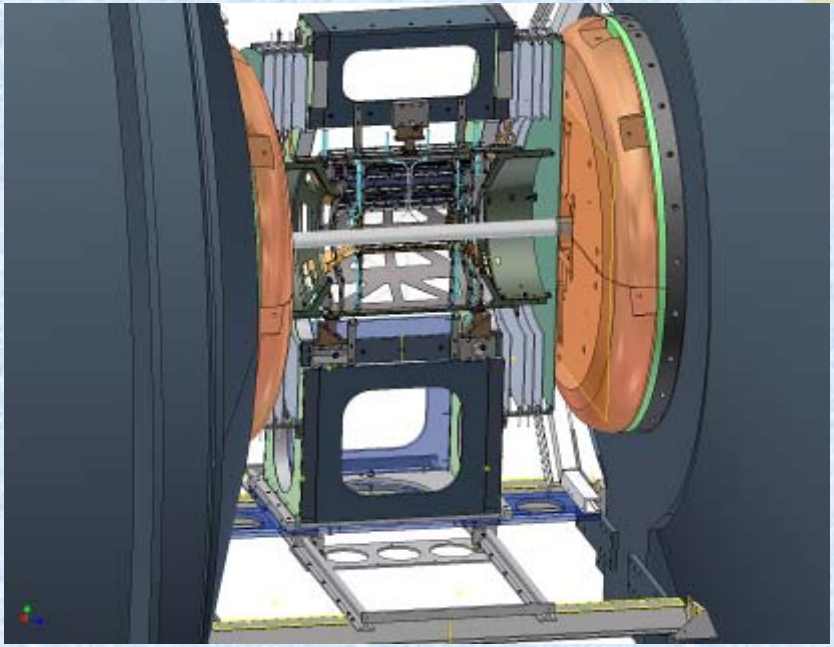
2 half detectors,

4 barrels per detector

VTX/FVTX Installation Plan

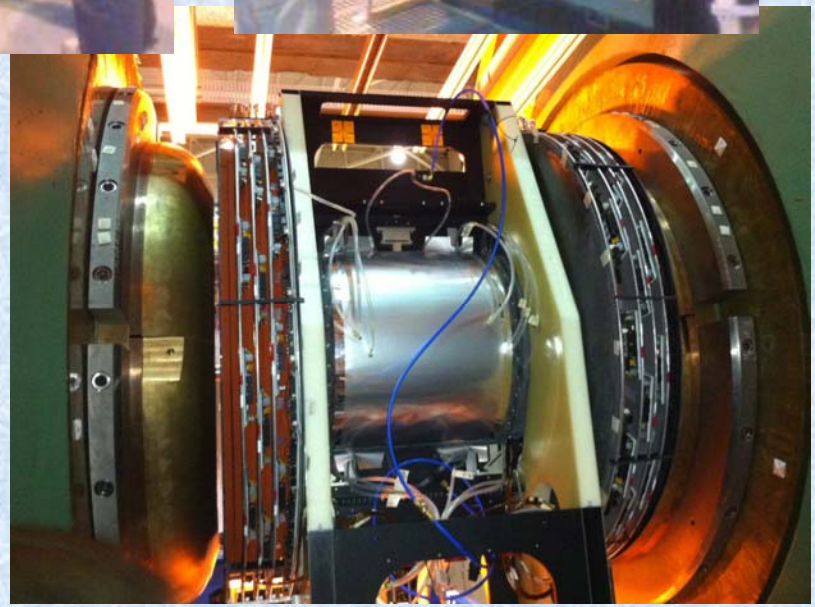
(Same as last year



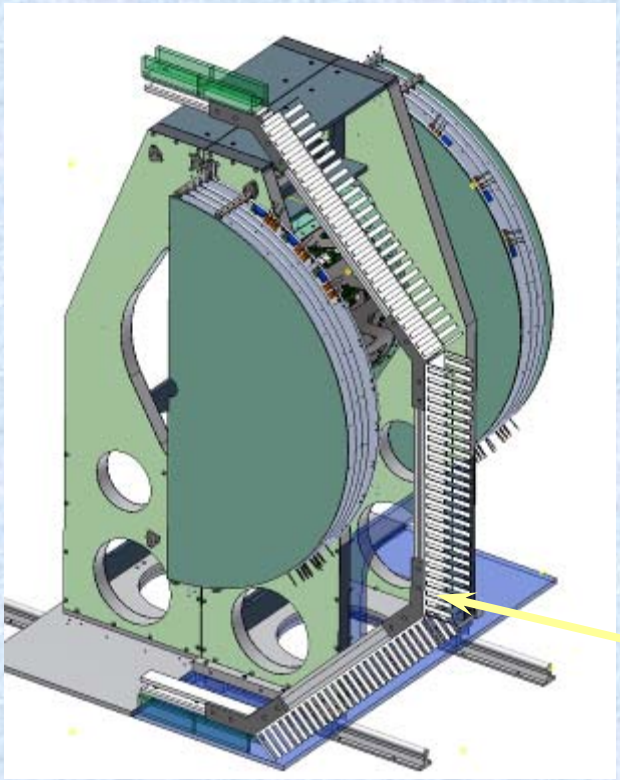


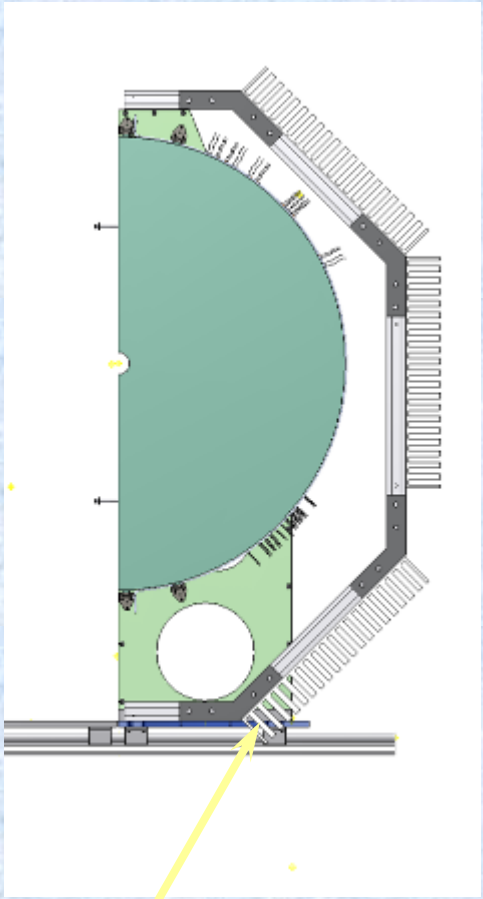
West ½ of VTX lifted by crane with slings to extended rail and slid under BP to the west rail extension, then rotated with slings and crane to upright position and placed on west side in approximate final position. East side then lifted with slings and place on east extended rails. Final alignment and alignment stops added with survey group.

VTX Installation 2010
2011 removal and Re-installation with FVTX will be similar



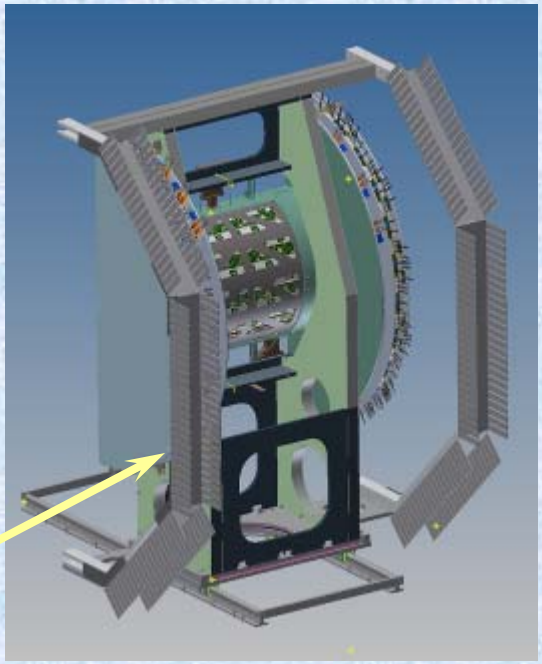
VTX cable tray concept





2010

(3" wide)



2011

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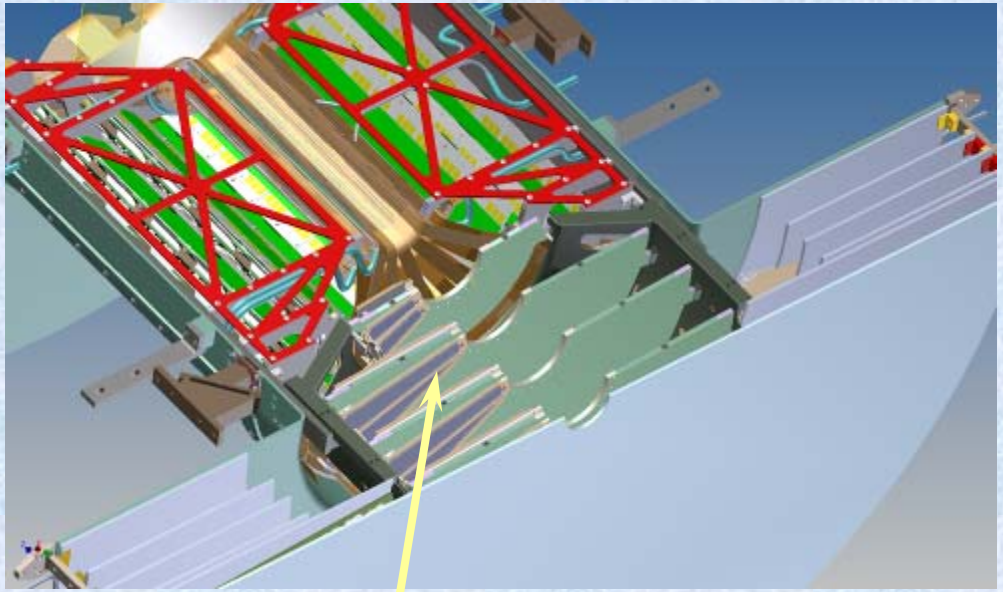
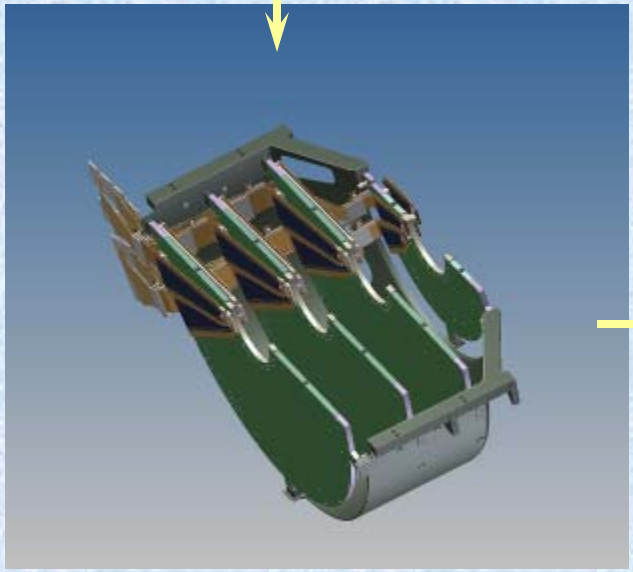
Cable Trays

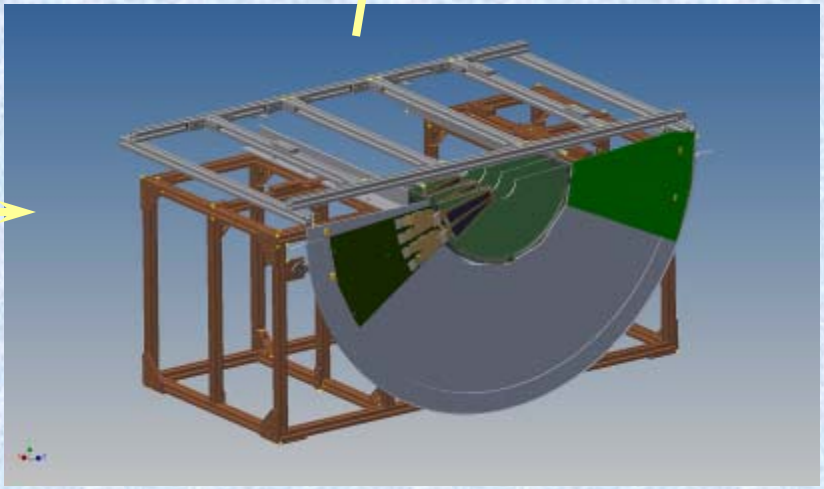
Chillers

Cooling Manifold

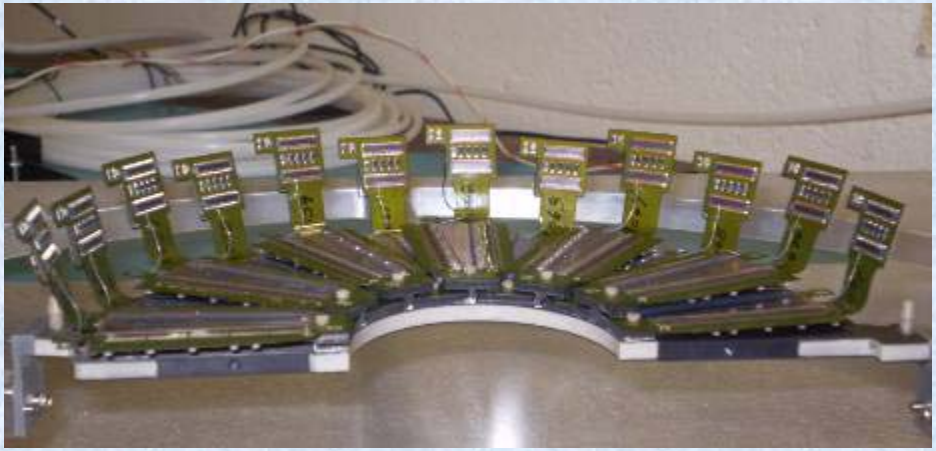
FVTX Assembly and integration into VTX

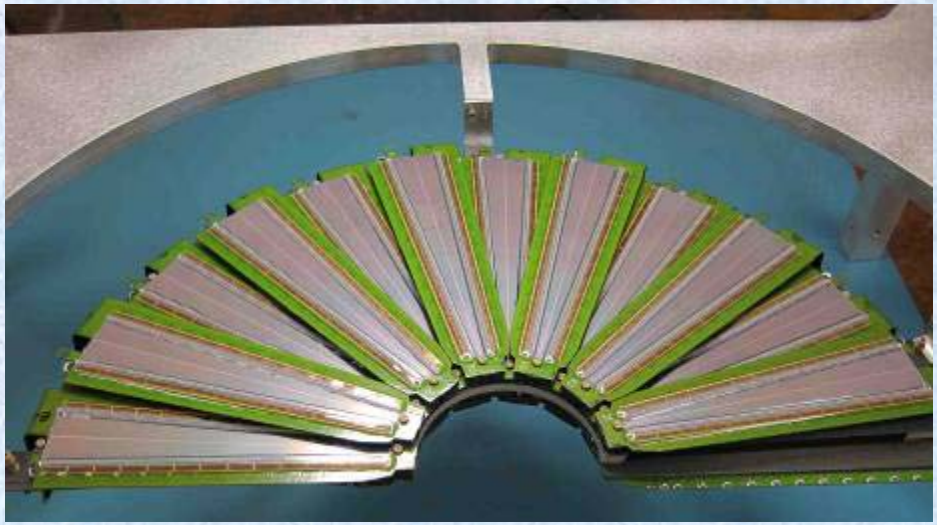






FVTX /VTX Assembly & Integration





FVTX Electronics

- Two electronics racks on the bridge for LV, each containing two Vicor MegaPACs, PHENIX LV Distribution crate and FVTX LV Distribution crate.
- Second Weiner-Iseg bias crate and FVTX Bias Distribution crate added to CME Rack.
- Data fibers: 15 cables of 6 MTP 12 fiber connectors = 1080 total fibers.
- Control fibers: One cable of 72 LC-LC terminated at patch bays at each end.
- LV cables :
- - Wedges:96 eight pair AWG#22 terminated in DF11 connectors.
- - ROCs: 24 twelve pair AWG#16 terminated in Tyco 2-106527-4 connectors.
- Bias cables:
- - 48 eight pair AWG#22 extension cables. Minifit on one end and CPC on the other.
- - 48 breakout cables: CPC to 8 Rg-174 cables each terminated in MMCX connector.

Existing VTX/FVTX PLC Thermocouple Temperature Interlock System

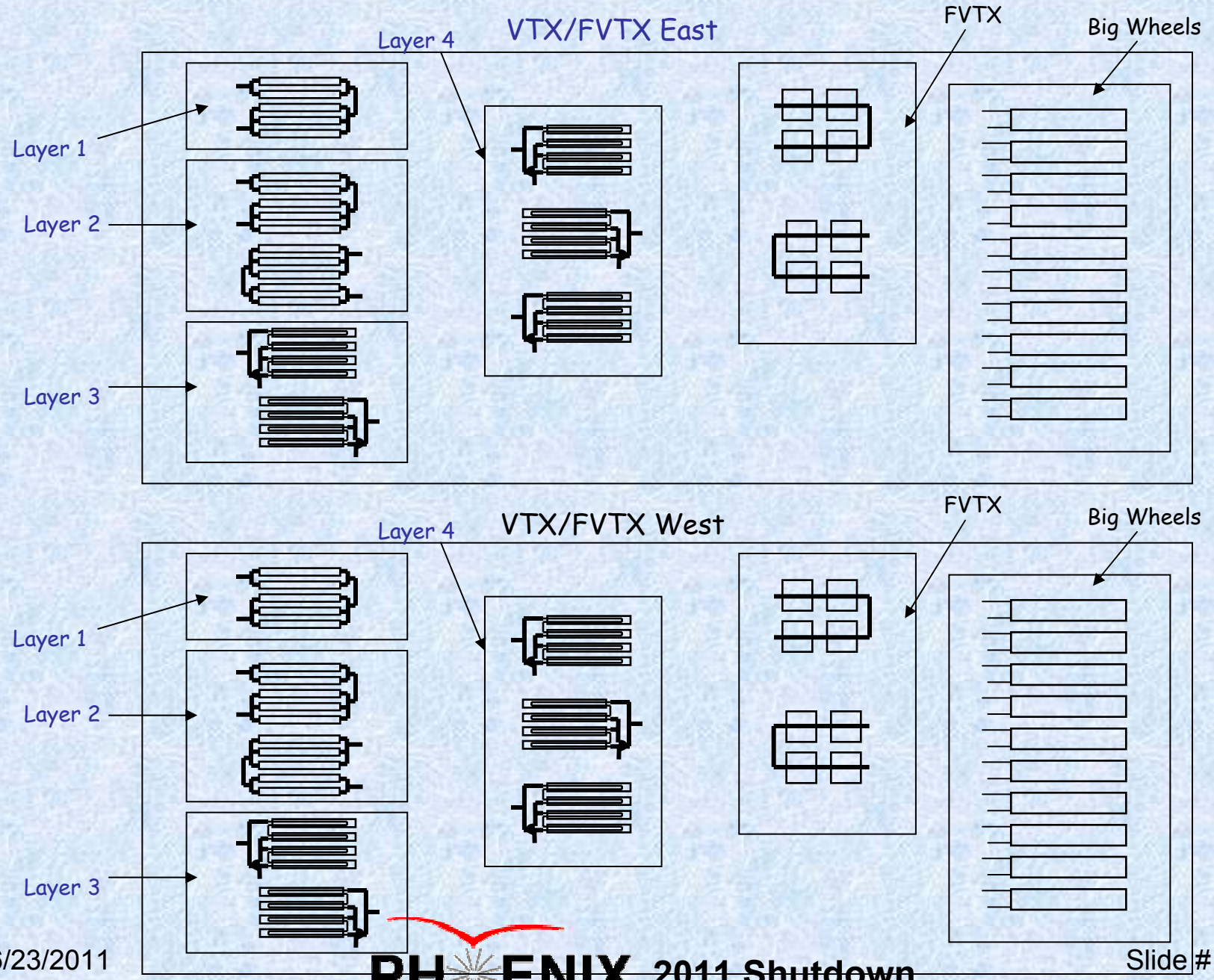
PLC Thermocouple Input Modules

We will be adding 40 additional thermocouples for the FVTX, 10 each for the NE, NW, SE, and SW detector segments. Interlocks with LV and bias power supplies, similar to VTX.

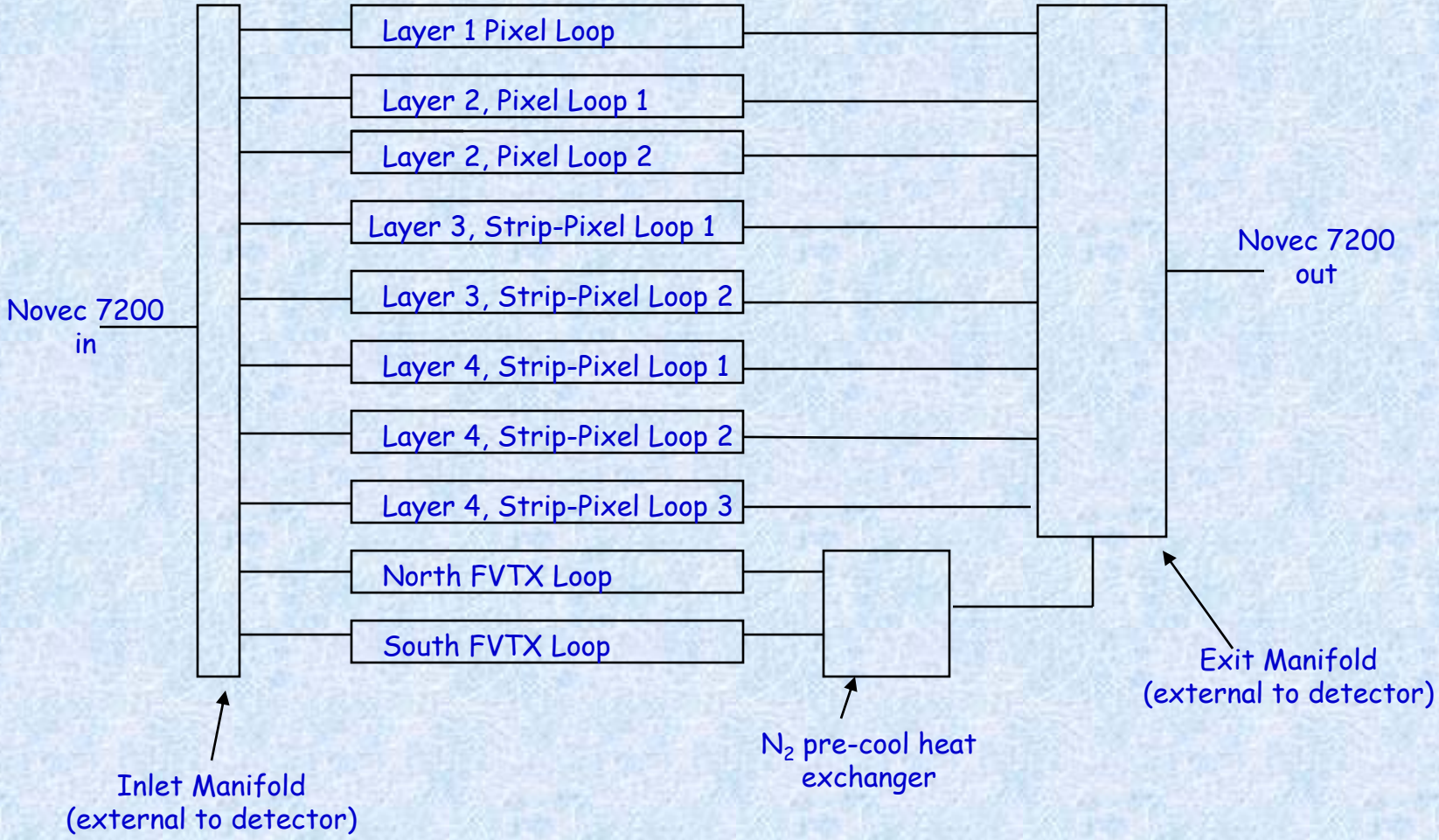
Cooling and gas systems

- N_2 gas to prevent moisture on electronics. Existing PHENIX N_2 to be utilized. Expected flow ~ 50 liters/hr
- Separate cooling systems for Big Wheels (read out electronics) and detector electronics
- 3 chillers (existing) one for detector electronics, one for big wheels and one common spare

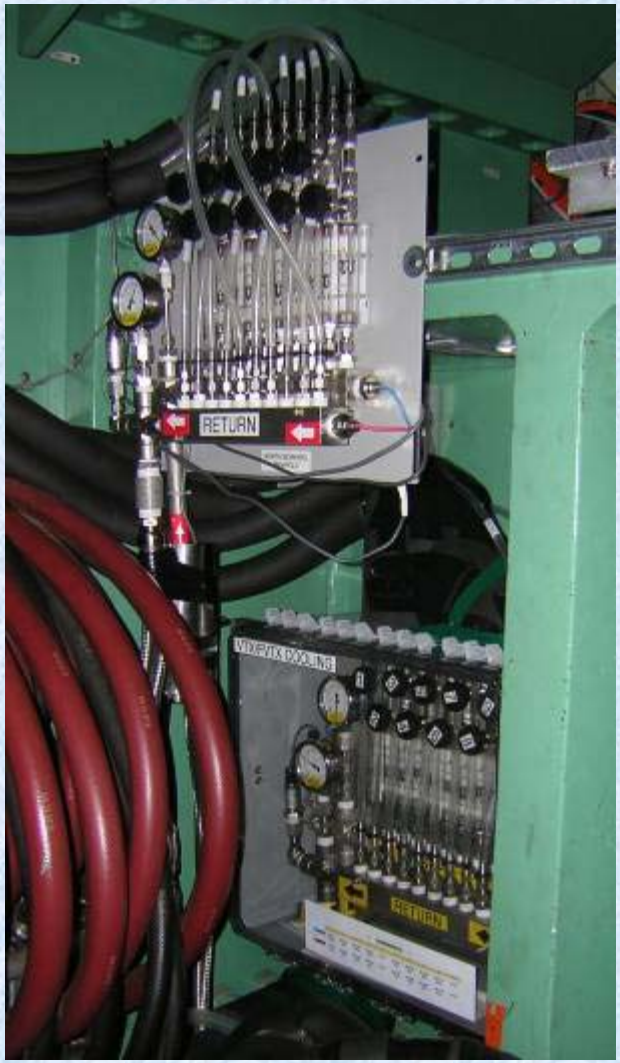
1. VTX/FVTX Sensor cooling analysis summary: Flow Concept



VTX/FVTX Flow Schematic, ½ detector



VTX/FVTX Cooling system System



Channels for FVTX already exist. They just need to be plumbed in.

Modify/Upgrade Flow Transmitter

-Current model rated -7 to 107°C but does not cycle temperature well. We operate at -2C

-Looking into using hardware and replacing its transmitter with a sealed hall probe. We have a working prototype in 510

2011 Shutdown Plan

TECHNICAL SUPPORT 2011

Prep for shutdown	2/1-6/30/2011
• Define tasks and goals	
• Analysis and design of fixtures, tools and procedures	
• Fabricate/procure tools and fixtures	
• Tests, mockups, prototypes	
• Receive, fabricate, modify, finish installables (bigwheels, tubing, etc.)	
• MuTr, RPC1 and VTX/FVTX installation review (combined)	~6/15/2011
• Assembly and QA tests	
AH Crane temporary reconfiguration (crane out of service during reconfig)	4/15-6/3/2011
End of Run Party	6/23/2011
Run 11 Ends	6/29/2010
Shutdown Standard Tasks	7/1-7/21/2010
• Open wall, disassemble wall, Remove MuID Collars,	
• Move EC to AH, etc.	
PC1 repairs – Anders O.	7/1-7/10/2010
IR Crane repairs and upgrade	7/21-7/28
Disassemble VTX services	7/11-7/22
Remove VTX and transport to Chemistry Lab	7/25/2011
BBC North maintenance	7/22-7/29/2011
MuTr North Station 1 work	
• Install access (Sta. 1work platforms & CM west side hanging platform)	7/25-7/29/2011
• Remove 1 section of bridge (1 week) (CAD Techs)	8/1-8/5/2011
• Disconnect Cables, hoses etc, ID/label all (1 week)	8/8-8/12/2011
• Remove FEE plates and chambers (1 week)	8/15-8/19/2011
• Station 2 Maintenance/upgrade through access opened by station 1 removal (3 weeks concurrent with next task)	8/22/-9/9/2011
• Clean/install new parts and upgrades (MuTr (3 weeks, concurrent At RPC Factory)	8/22/-9/9/2011
• Re-install chambers and FEE plates (1 week)	9/12-9/16/2011
• Re-cable, re-hose and test (3 weeks)	9/19-10/7/2011

PHENIX

Planning For the 2011 Shutdown (cont'd)

TECHNICAL SUPPORT 2011

• MuTr North& South Station 2 & 3 Re-cap clamps (No internal work platforms to upper octants) (Need CAD Techs to remove MMS east vertical lampshade)	7/25-10/31/2011
• VTX maintenance/upgrade and integration of FVTX onto VTX support structure	
◦ Build 2 FVTX racks	7/1-9/15/2011
◦ Disassemble VTX	7/11-7/25/2011
◦ repair/upgrade/test/reassemble/resurvey VTX	7/25-9/30/2011
◦ Assemble FVTX, presurvey	Present-10/3/2011
◦ Integrate FVTX into VTX, final internal survey	10/3-10/14/2011
◦ Install VTX/FTX, Re-connect VTX services, Install FVTX services, survey and QA tests	10/17-10/28/2011
◦ VTX/FVTX Commissioning	10/31-11/30/2001
• RPC1 upgrades	7/25-10/28/2011
◦ Pre-survey RPC1's at factory (2 weeks, 1 each for n & s)	7/25-8/12/2011
◦ Build 1 new rack, upgrade existing RPC1 prototype rack	7/25-8/12/2011
◦ Install north RPC1 (including north rack) (3 weeks)	8/15-9/2/2011
• Move Station 1 work platforms to south station 1	10/10-10/14/2011
◦ Install south RPC1 (including south rack) (3 weeks)	10/17-11/4/2011
• Upgrade AH crane	8/15-9/15/2011
• DC/PC1 East troubleshooting (DC moved forward on rail for access)	10/15-11/15/2011
• Install VTX&FVTX (including installation of 2 racks on bridge) (2 weeks)	9/26-11/7/2011
• Undefined detector subsystem maintenance and repairs	7/25-11/7/2011
• Prep for EC roll in, reinstall MMS lampshade	11/3-11/7/2011
• Roll in EC	11/10/2011
• Prep IR for run	11/10-11/17/2010
• VTX, FVTX and RPC1 Services and commissioning (including 4 new racks)	9/16-11/30/201
• Pink/Blue/White sheets	11/17-11/30/2011
• Run 12 cooldown	12/1/2011